"The Educational Annual," a handy reference volume of about 200 crown octavo pages on educational subjects, which is likely to prove a convenience to school managers, teachers, and others interested in the promotion of national education. It is proposed to review elementary education, technical education, agricultural education, industrial, reformatory, truant, and ragged schools, secondary education, and, generally, the purpose and work of the Education Department, the Science and Art Department, the training of teachers, and the teachers' organizations.

MESSRS. SONNENSCHEIN AND CO. will issue shortly a translation of Moritz Hauptmann's "Nature of Harmony and Metre." The work consists of three parts. The first part considers the evolution of harmony from acoustics, taking as basis the Hegelian theory of sound. In the second part the author discusses metre and rhythm, which are respectively analogous to harmony and melody. The last part of the book is concerned with the union of metre and harmony—that is, harmony and melody in concrete combination with metre and rhythm.

A SPECIMEN of the golden mullet (*Mugil auratus*, Risso), 320 mm. in length, has been caught at Stromstad, on the south-west coast of Sweden. Only once before has a specimen of this fish been caught on the Swedish coast.

THE authorities of the Mason Science College, Birmingham, have issued the syllabus of day classes to be held during the session 1888-89.

ACCORDING to the *American Naturalist*, the proposed site of the National Zoological Park at Washington is one of great beauty, and even grandeur. It is in the valley of Rock Creek, just beyond the city limits, and at two points walls of rock rise to a height of over 80 feet. The Rock Creek will afford what the *American Naturalist* describes as "unrivalled facilities" for the care of aquatic mammals and birds of all kinds. Nearly the whole tract is covered by a fine growth of forest trees.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented Mr. William Norman; a Lesser White-nosed Monkey (*Cercopithecus petaurista* ♂) from West Africa, presented by Mr. W. Blandford Griffith; a Tiger (*Felis tigris* ♂) from India, presented by Sir E. C. Buck, C.M.Z.S.; a Bengal Cat (*Felis bengalensis*) from India, presented by Mr. W. L. Sclater, F.Z.S.; a Black-backed Piping Crow (*Gymnorhina leuconota*), two Leadbeater's Cockatoos (*Cacatua leadbeateri*) from Australia, a Common Magpie (*Pica rustica*), four Common Herons (*Ardea cinerea*), British, two Himalayan Monauls (*Lophophorus impeyanus* ♂ ♂) from the Himalayas, two Gold Pheasants (*Thaumalea picta* ♂ ♀), two Silver Pheasants (*Euplocamus nycthemerus* ♂ ♀), two Mandarin Ducks (*Æx galericulata*) from China, a Javan Pea-fowl (*Pavo spicifer* ♂) from Java, two Common Pea-fowls (*Pavo cristatus* ♂ ♀) from India, a Rose-crested Cockatoo (*Cacatua moluccensis*) from Moluccas, a Hyacinthine Macaw (*Ara hyacinthina*), a Blue and Yellow Macaw (*Ara ararauna*) from South America, a Great Eagle Owl (*Bubo maximus*), European, presented by Mr. Charles Clifton, F.Z.S.; a Bare-eyed Cockatoo (*Cacatua gymnopis*) from North Australia, presented by Mrs. Fishlock; an Imperial Eagle (*Aquila imperalis*) from Morocco, presented by Mrs. Ernest H. Forwood; two American Box Tortoises (*Terrapene carinata*), two Alligator Terrapins (*Chelydra serpentina*), a Speckled Terrapin (*Clemmys guttata*), four Sculptured Terrapins (*Clemmys insculpta*) from North America, presented by Prof. O. C. Marsh, C.M.Z.S.; a Horned Lizard (*Phrynosoma cornutum*) from North America, presented by Master Howard Sexton; six Guinea Pigs (*Cavia porcellus*, var.), presented by Mr. R. F. Bennett; a Common Kingfisher (*Alcedo ispida*), British, deposited; a New Zealand Parrakeet (*Cyanorhamphus novæ-zealandiæ*) from New Zealand, purchased; two Chinchillas (*Chinchilla lanigera*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET 1888 *c* (BROOKS).—Dr. H. Kreutz (*Astr. Nachr.*, No. 2853) has computed the following elements and ephemeris for this comet from observations made at Vienna on August 9, and at Strassburg on August 10 and 11. The middle place was represented closely.

$$T = 1888 \text{ July } 16{\cdot}1982, \text{ Berlin M.T.}$$

$$\left.\begin{aligned}\omega &= 34^{\circ}\ 36'{\cdot}90\\ \Omega &= 94\ \ 59{\cdot}69\\ \iota &= 71\ \ 25{\cdot}07\end{aligned}\right\}\text{ Mean Eq. } 1888{\cdot}0.$$

$$\log q = 9{\cdot}92444$$

$$\begin{aligned}x &= [9{\cdot}51743]\, r \,.\, \sin\,(v + 229^{\circ}\ 57{\cdot}12)\\ y &= [9{\cdot}99943]\, r \,.\, \sin\,(v + 148\ \ 23{\cdot}72)\\ z &= [9{\cdot}97573]\, r \,.\, \sin\,(v + \ \ 59\ \ 24{\cdot}32)\end{aligned}$$

Ephemeris for Berlin Midnight.

1888.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Brightness.
Aug. 23	12 5 53	42 14·0 N.	0·0390	0·2201	0·74
25	12 19 20	41 26·1			
27	12 32 20	40 33·4	0·0568	0·2254	0·67
29	12 44 50	39 36·5			
31	12 56 49	38 36·1	0·0746	0·2326	0·60
Sept. 2	13 8 17	37 32·8			
4	13 19 16	36 27·2	0·0921	0·2413	0·53
6	13 29 45	35 19·9			
8	13 39 46	34 11·3 N.	0·1094	0·2514	0·47

The brightness on August 9 is taken as unity.

YALE COLLEGE OBSERVATORY.—The Reports of this Observatory for the last two years have recently been published. That for the year 1886-87 notes the retirement of Mr. Orray T. Sherman, who had charge of the Thermometric Bureau up to the date of his resignation in November 1886, and the renewal of subscriptions for the support of the work with the heliometer for another period of three years. Prof. Loomis had borne the expense of printing and distributing Dr. Elkin's memoir upon the Pleiades, and a second grant of 600 dollars had been made from the Bache Fund to enable Mr. Asaph Hall, Jun., the Assistant Astronomer at the Observatory, to carry on his observations of Titan for the determination of the mass of Saturn. Dr. Elkin had continued his heliometer measures for the determination of the mean parallax of the first magnitude stars; and the Report for 1887-88 records the completion of this work, and gives the results for the ten stars observed. These are as follows:—

Aldebaran	+ 0″·116 ± 0″·029	α Leonis	+ 0″·093 ± 0″·048
Capella	+ 0·107 ± 0·047	Arcturus	+ 0·018 ± 0·022
α Orionis	− 0·009 ± 0·049	α Lyræ	+ 0·034 ± 0·045
Procyon	+ 0·266 ± 0·047	α Aquilæ	+ 0·199 ± 0·047
Pollux	+ 0·068 ± 0·047	α Cygni	− 0·042 ± 0·047

The probable errors include an estimation of the probable systematic error of the measures, and are not as usual confined to the mere casual error of observation.

The results for Procyon and α Aquilæ are in close accord with those obtained by Auwers and Wagner for the first star, and by W. Struve for the second; and that for Aldebaran agrees with Prof. Asaph Hall's value; the value found by O. Struve—viz. + 0″·516—would appear, therefore, to be erroneous. But Dr. Elkin's parallax for α Lyræ is much smaller than the results which have been hitherto obtained by other observers, and which give in the mean a parallax quite five times as great as he has found. But the most remarkable result is that obtained for Arcturus, the practically insensible parallax of which seems in such strong contrast to its large proper motion. Dr. Elkin is well satisfied that the parallax of this star is extremely small, for his value depends upon eighty-nine observations and on five pairs of comparison stars, all in reasonable agreement.

The mean of the ten parallaxes gives for the mean parallax of a first magnitude star—

$$+\ 0''{\cdot}089 \pm 0''{\cdot}015,$$

a result according well with the values deduced by Gyldén (0″·084) and Peters (0″·102).

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The heliometer is at present engaged on a triangulation of stars near the North Pole for Prof. Pickering, but the last three months of the present year it is to be employed in the determination of the solar parallax during the extremely favourable opposition of Iris. Measures of the diameters of the sun and of Mars, measures of certain double stars, the investigation of the parallaxes of 6 B Cygni, and of 18115/22 Lalande, are amongst the other labours of the Observatory. Mr. Hall has nearly completed the reduction of his measures of Titan.

GRAVITATION IN THE STELLAR SYSTEMS.—Prof. Asaph Hall supplies an interesting paper on "The Extension of the Law of Gravitation to Stellar Systems," in *Gould's Astronomical Journal*, No. 177, to which Dr. Elkin's new value of the parallax of Arcturus might afford a most striking illustration. Prof. Hall shows that there is a theoretical difficulty in proving the law of Newton for double stars which we cannot overcome, though the probability of the existence of this law can be increased as more double star orbits, and those very differently situated, are determined. Still, even then, before the universality of the law can be inferred, there remains the difficulty of the so-called "runaway" stars, like Groombridge 1830, stars moving through space with the speed of a comet at perihelion, and yet with no visible attracting body near them. Of these Prof. Hall supplies a list. But if Dr. Elkin's value of the parallax of Arcturus be accepted, that star would outstrip any of those given in this table. For its speed in the direction at right angles to the line of sight would be 373 miles per second, a speed compared with which its speed in the line of sight, as given by Dr. Huggins, 55 miles per second, becomes small. Prof. Hall concludes, therefore, that though Newton's law is one of the greatest generalizations of science, it is better and safer "to await further knowledge before we proceed, as Kant has done, to construct the universe according to this law."

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 *AUGUST* 26—*SEPTEMBER* 1.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on August 26

Sun rises, 5h. 5m.; souths, 12h. 1m. 28·9s.; sets, 18h. 57m.: right asc. on meridian, 10h. 22·1m.; decl. 10° 11′ N. Sidereal Time at Sunset, 17h. 19m.

Moon (at Last Quarter August 29, 14h.) rises, 20h. 54m.*; souths, 3h. 22m.; sets, 10h. 2m.: right asc. on meridian, 1h. 41·6m.; decl. 5° 0′ N.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. on meridian. h. m.	Declination on meridian. ° ′
Mercury..	5 14	12 13	19 12	10 33·8	10 52 N.
Venus	6 14	12 51	19 28	11 11·5	6 42 N.
Mars	12 27	16 48	21 9	15 9·6	19 12 S.
Jupiter	13 2	17 23	21 44	15 44·5	19 8 S.
Saturn	3 6	10 43	18 20	9 3·5	17 33 N.
Uranus	8 59	14 35	20 11	12 56·1	5 20 S.
Neptune..	21 56*	5 43	13 30	4 2·3	18 59 N.

* Indicates that the rising is that of the preceding evening.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
R Arietis	2 9·8	24 32 N.	Aug. 26,		*M*
R Ceti	2 20·3	0 41 S.	,, 27,		*M*
λ Tauri	3 54·5	12 10 N.	,, 27,	22 41	*m*
			,, 31,	21 33	*m*
U Monocerotis	7 25·5	9 33 S.	,, 27,		*m*
R Virginis	12 32·8	7 36 N.	,, 31,		*M*
S Boötis	14 19·1	54 19 N.	,, 27,		*M*
δ Libræ	14 55·0	8 4 S.	,, 30,	22 8	*m*
W Scorpii	16 5·2	19 51 S.	,, 28,		*M*
W Ophiuchi	16 15·4	7 26 S.	,, 28,		*M*
R Draconis	16 32·4	67 0 N.	,, 30,		*M*
U Ophiuchi	17 10·9	1 20 N.	,, 30,	0 28	*m*
			,, 30,	20 36	*m*
W Sagittarii	17 57·9	29 35 S.	,, 27,	0 0	*M*
Z Sagittarii	18 14·8	18 55 S.	,, 27,	1 0	*M*
			,, 31,	0 0	*m*
U Sagittarii	18 25·3	19 12 S.	,, 26,	0 0	*M*
β Lyræ	18 46·0	33 14 N.	,, 26,	1 0	m_2
R Aquilæ	19 1·0	8 4 N.	,, 29,		*m*
X Cygni	20 39·0	35 11 N.	Sept. 1,	3 0	*m*

M signifies maximum; *m* minimum; m_2 secondary minimum.

Occultation of Star by the Moon (visible at Greenwich).

Aug.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. ° °
26	ξ^2 Ceti	4	23 20	0 22†	98 238

† Occurs on the following morning.

Meteor-Showers.

	R.A. °	Decl. °	
	6	11 N.	Swift.
Near β Trianguli	30	35 N.	
,, 33 Cygni	305	54 N.	Swift, bright. Sept. 1.
,, δ Cephei	336	58 N.	Swift.

GEOGRAPHICAL NOTES.

THE *Times* printed on Tuesday the substance of communications received from Mr. Joseph Thomson, dated from the city of Morocco, July 22. Mr. Thomson writes in the highest spirits, and with evident satisfaction at the results he has so far attained; for much of the country through which he has had to pass is in a state of rebellion, and the local authorities have done more to hinder than to help him. Mr. Thomson sailed from Tangier to Casablanca, and thence travelled overland to Mogador. After three weeks' preparation there he made his final start, and, as he states, soon discovered that the greatest danger to his success would not be the mountaineers nor even the opposition of the Government officials, but the half-dozen men who formed the *personnel* of his small party. Mr. Thomson's past experience in Africa enabled him to deal effectively with this difficulty. By a series of surprises and cleverly-planned excursions he has been able to enter the mountain fastnesses of Morocco and do more than any previous traveller has done. From Demnat he made two extremely interesting trips into the lower ranges, visiting some remarkable caves and equally remarkable ruins, and one of the most wonderful natural bridge-aqueducts in the world. Geologically and geographically these trips are alike important. They were followed by a dart across the main axis of the Atlas to the district of Tiluit, which lies in the basin of the Draa. Here he spent a very delightful ten days, though virtually a prisoner. As the tribes further west on the southern slope were in revolt, Mr. Thomson was compelled to return to the northern plains. Starting once more, he crossed the mountains by a pass a little south of Jebel Tizah, ascended by Hooker, and reached Gindafy safely. He was able to make a trip up a wonderful cañon, which he declares rivals those of America for depth and grandeur, and ascended a mountain, where he and his party were confined to their tents until it suited them to go back to their starting-point. Here, unfortunately, Mr. Thomson's young companion, Mr. Crichton Browne, was stung by a scorpion, and they were compelled to return, happily by a new route. Though laid up for a period, fortunately in time Mr. Crichton Browne recovered. From his previous starting-point Mr. Thomson scored another great triumph. He crossed the mountains once more, and ascended with no small danger and difficulty the highest peak of the Atlas Range north of Amsiviz, a height of 12,500 feet—the highest peak, by 1500 feet, ever attained. This he describes as the most interesting of all his trips, and he enjoyed it thoroughly, though he had to sleep on the ground and was glad to make a meal on walnuts. On his return, Mr. Thomson deemed it advisable to go into the town of Morocco to recruit and wait the arrival of further supplies from the coast. He intended to resume work in a few days after the date of his letter. He proposed first to make for the Urika River and penetrate the mountains up its course. He will then work his way round to Mogador, which he expects to reach about the end of August. There probably his work of exploration will end, though he may make one or two short trips into the interior and down to Agadir. The return route to Tangier will probably be from Mogador to the city of Morocco, thence to Mazagan on the coast, and on to Casablanca and Rabat. Then he will leave the sea again and go to Mequinez and Fez, reaching Tangier about the end of the year. The *Times* understands that his contributions to various branches of science, especially to botany, will be of the highest value.

A LETTER from Cayenne to the *Temps* states that M. Coudreau, who has recently explored Guiana, arrived there last month after having travelled for eleven months in the western range of the Tumuc-Humac Mountains, between the source of

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